CLAIMS

1. An optical information recording device, wherein a mark or a space having a length corresponding to a length of a data recording code is formed by irradiating a rotating optical information recording medium with laser light to change optical characteristics of a photosensitive recording layer, and

the mark is formed by irradiation of the laser light with a power being switched among a plurality of power levels including at least a recording power level and an erase power level,

the device comprising:

a linear velocity setting circuit for setting a first linear velocity v1 and a second linear velocity v2 that is higher than the first linear velocity v1 for the rotating optical information recording medium;

a recording pulse generation circuit for generating a recording pulse signal, depending on a result of setting by the linear velocity setting circuit; and

a laser drive circuit for irradiating the optical information recording medium with the laser light based on the recording pulse signal generated by the recording pulse generation circuit,

wherein the laser drive circuit controls a power level of the laser light in such a manner that

$Pbt1 \leq Pe1$ and $Pe2 < Pbt2 \leq Pwa2$ is satisfied,

where Pbt1 represents a first inter-pulse power level indicating a power level between recording pulses for the first linear velocity v1,

Pbt2 represents a second inter-pulse power level indicating a power level between the recording pulses for the second linear velocity v2,

Pwa2 represents a recording power level indicating a power level of the recording power for the second linear velocity v2,

Pe1 represents a first erase power level indicating a power level of the erase power for the first linear velocity v1, and

Pe2 represents a second erase power level indicating a power level of the erase power for the second linear velocity v2.

2. The optical information recording device according to claim 1, wherein the laser drive circuit controls the second inter-pulse power level Pbt2 to be Pbt2=Pwa2, and controls a waveform of the recording pulse to be a rectangular wave.

3. The optical information recording device according to claim 1, wherein the laser drive circuit controls the inter-pulse power level Pbt so that (Pbt–Pe) is increased between Pbt1 and Pbt2, depending on an increase in the linear velocity v,

where Pbt represents a power level between the recording pulses for a linear velocity v of $v1 < v < v2$, and

Pe represents a power level of the erase power for the linear velocity v.

4. The optical information recording device according to claim 1, wherein a waveform of the recording pulse is a rectangular wave for a predetermined linear velocity of v0 or more, v0 having a relationship $v1 < v0 < v2$.

5. An optical information recording device, wherein a mark or a space having a length corresponding to a length of a data recording code is formed by irradiating a rotating optical information recording medium with laser light to change optical characteristics of a photosensitive recording layer, and

the mark is formed by irradiation of the laser light with a power being switched among a plurality of power levels including at least a recording power level and an erase power level,

the device comprising:

a linear velocity setting circuit for setting a first linear velocity v1 and a second linear velocity v2 that is higher than the first linear velocity v1 for

the rotating optical information recording medium;

a recording pulse generation circuit for generating a recording pulse signal, depending on a result of setting by the linear velocity setting circuit; and

a laser drive circuit for irradiating the optical information recording medium with the laser light based on the recording pulse signal generated by the recording pulse generation circuit,

wherein the laser drive circuit controls a power level of the laser light in such a manner that

$Pbt1 \leq Pe1$ and $Pe2 < Pwb2 < Pwa2$ is satisfied, and

a waveform of the laser light for the second linear velocity v2 is set to be a stepwise waveform such that a recording pulse of the power level Pwb2 is provided immediately after a recording pulse of the power level Pwa2,

where Pbt1 represents a first inter-pulse power level indicating a power level between recording pulses for the first linear velocity v1,

Pwa2 represents a recording power indicating a power level of the recording power for the second linear velocity v2,

Pwb2 represents a second recording power indicating a power level of a second recording power for the second linear velocity v2,

Pe1 represents a first erase power level indicating a power level of the erase power for the first linear velocity v1, and

Pe2 represents a second erase power level indicating a power level of the erase power for the second linear velocity v2.

6. The optical information recording device according to claim 5, wherein the recording pulse generation circuit sets a width of each step of the stepwise waveform to be longer than 1/2 of a channel clock cycle for the second linear velocity v2.

7. An optical information recording device, wherein a mark or a space

having a length corresponding to a length of a data recording code is formed by irradiating a rotating optical information recording medium with laser light to change optical characteristics of a photosensitive recording layer, and

the mark is formed by irradiation of the laser light with a power being switched among a plurality of power levels including at least a recording power level and an erase power level,

the device comprising:

a linear velocity setting circuit for setting a first linear velocity v1, which is a lower limit, and a second linear velocity v2, which is an upper limit, with respect to the rotating optical information recording medium,

a recording pulse generation circuit for generating a recording pulse signal, depending on a result of setting by the linear velocity setting circuit; and

a laser drive circuit for irradiating the optical information recording medium with the laser light based on the recording pulse signal generated by the recording pulse generation circuit,

wherein $Pbt1 \leq Pe1$ and $Pe2 < Pwb2 < Pwa2$ are satisfied,

the laser light is irradiated while switching powers among the recording power level, the first erase power level and the first inter-pulse power level, when the linear velocity v is $v1 < v < v0$,

a waveform of the laser light is set to be a stepwise waveform such that a recording pulse of the power level Pwb2 is provided immediately after a recording pulse of the power level Pwa2, when the linear velocity v is $v0 < v < v2$, and

the power level Pwb of the second recording power is controlled so that (Pwb−Pe) is increased, depending on an increase in the linear velocity v,

where Pbt1 represents a first inter-pulse power level indicating a power level between recording pulses for the first linear velocity v1,

Pwa2 represents a recording power indicating a power level of the recording power for the second linear velocity v2,

Pwb2 represents a second recording power indicating a power level of a

second recording power for the second linear velocity v2,

Pe1 represents a first erase power level indicating a power level of the erase power for the first linear velocity v1,

Pe2 represents a second erase power level indicating a power level of the erase power for the second linear velocity v2,

$v1<v0<v2$ is satisfied,

Pwb represents a power level of the second recording power for a linear velocity v of $v1<v<v2$, and

Pe represents a power level of the erase power for the linear velocity v.

8. The optical information recording device according to claim 7, wherein the recording pulse generation circuit sets a width of each step of the stepwise waveform to be longer than 1/2 of a channel clock cycle for the second linear velocity v2.

9. An optical information recording device, wherein a mark or a space having a length corresponding to a length of a data recording code is formed by irradiating a rotating optical information recording medium with laser light to change optical characteristics of a photosensitive recording layer, and

the mark is formed by irradiation of the laser light with a power being switched among a plurality of power levels including at least a recording power level and an erase power level,

the device comprising:

a linear velocity setting circuit for setting a first linear velocity v1, which is a lower limit, and a second linear velocity v2, which is an upper limit, with respect to the rotating optical information recording medium,

a recording pulse generation circuit for generating a recording pulse signal, depending on a result of setting by the linear velocity setting circuit; and

a laser drive circuit for irradiating the optical information

recording medium with the laser light based on the recording pulse signal generated by the recording pulse generation circuit,

wherein duty ratios of the recording pulses are set to be constant when the linear velocity v is $v1 \leq v < v0$ and when the linear velocity v is $v0 < v \leq v2$, respectively, and

the power level Pbt of the inter-pulse is controlled so that (Pbt–Pe) is increased, depending on an increase in the linear velocity v, when the linear velocity v is $v1 \leq v < v0$ and when the linear velocity v is $v0 < v \leq v2$, respectively,

where Pbt represents a power level between the recording pulses for a linear velocity v of $v1<v<v2$, Pe represents a power level of the erase power for the linear velocity v, and $v1<v0<v2$.

10. The optical information recording device according to claim 9, wherein a correction amount of an edge position of the recording pulse is controlled to be constant with reference to a channel clock cycle when the linear velocity v is $v1 \leq v < v0$ and when the linear velocity v is $v0 < v \leq v2$, respectively.

11. An optical information recording method, wherein a mark or a space having a length corresponding to a length of a data recording code is formed by irradiating a rotating optical information recording medium with laser light to change optical characteristics of a photosensitive recording layer, and

the mark is formed by irradiation of the laser light with a power being switched among a plurality of power levels including at least a recording power level and an erase power level,

the method comprising:

a linear velocity setting step of setting a first linear velocity v1 and a second linear velocity v2 that is higher than the first linear velocity v1 for the rotating optical information recording medium;

a recording pulse generation step of generating a recording pulse signal, depending on a result of setting by the linear velocity setting step; and

a laser drive step of irradiating the optical information recording medium with the laser light based on the recording pulse signal generated by the recording pulse generation step,

wherein in a laser drive step, a power level of the laser light is controlled in such a manner that

$Pbt1 \leq Pe1$ and $Pe2 < Pbt2 \leq Pwa2$ is satisfied,

where Pbt1 represents a first inter-pulse power level indicating a power level between recording pulses for the first linear velocity v1,

Pbt2 represents a second inter-pulse power level indicating a power level between the recording pulses for the second linear velocity v2,

Pwa2 represents a recording power level indicating a power level of the recording power for the second linear velocity v2,

Pe1 represents a first erase power level indicating a power level of the erase power for the first linear velocity v1, and

Pe2 represents a second erase power level indicating a power level of the erase power for the second linear velocity v2.

12. The optical information recording method according to claim 11, wherein in the laser drive step, the second inter-pulse power level Pbt2 is controlled to be Pbt2=Pwa2, and waveform of the recording pulse is controlled to be a rectangular wave.

13. The optical information recording method according to claim 11, wherein in the laser drive step, the inter-pulse power level Pbt is controlled so that (Pbt–Pe) is increased between Pbt1 and Pbt2, depending on an increase in the linear velocity v,

where Pbt represents a power level between the recording pulses for a linear velocity v of $v1 < v < v2$, and

Pe represents a power level of the erase power for the linear velocity v.

14. The optical information recording method according to claim 11, wherein a waveform of the recording pulse is a rectangular wave for a predetermined linear velocity of v0 or more, v0 having a relationship $v1 < v0 < v2$.

15. An optical information recording method, wherein a mark or a space having a length corresponding to a length of a data recording code is formed by irradiating a rotating optical information recording medium with laser light to change optical characteristics of a photosensitive recording layer, and

the mark is formed by irradiation of the laser light with a power being switched among a plurality of power levels including at least a recording power level and an erase power level,

the method comprising:

a linear velocity setting step of setting a first linear velocity v1 and a second linear velocity v2 that is higher than the first linear velocity v1 for the rotating optical information recording medium;

a recording pulse generation step of generating a recording pulse signal, depending on a result of setting by the linear velocity setting step; and

a laser drive step of irradiating the optical information recording medium with the laser light based on the recording pulse signal generated by the recording pulse generation step,

wherein in the laser drive step, a power level of the laser light is controlled in such a manner that

$Pbt1 \leq Pe1$ and $Pe2 < Pwb2 < Pwa2$ is satisfied, and

a waveform of the laser light for the second linear velocity v2 is caused to be a stepwise waveform such that a recording pulse of the power level Pwb2 is provided immediately after a recording pulse of the power level Pwa2,

where Pbt1 represents a first inter-pulse power level indicating a power level between recording pulses for the first linear velocity v1,

Pwa2 represents a recording power indicating a power level of the recording power for the second linear velocity v2,

Pwb2 represents a second recording power indicating a power level of a second recording power for the second linear velocity v2,

Pe1 represents a first erase power level indicating a power level of the erase power for the first linear velocity v1, and

Pe2 represents a second erase power level indicating a power level of the erase power for the second linear velocity v2.

16. The optical information recording method according to claim 15, wherein in the recording pulse generation step, a width of each step of the stepwise waveform is set to be longer than 1/2 of a channel clock cycle for the second linear velocity v2.

17. An optical information recording method, wherein a mark or a space having a length corresponding to a length of a data recording code is formed by irradiating a rotating optical information recording medium with laser light to change optical characteristics of a photosensitive recording layer, and

the mark is formed by irradiation of the laser light with a power being switched among a plurality of power levels including at least a recording power level and an erase power level,

the method comprising:

a linear velocity setting step of setting a first linear velocity v1, which is a lower limit, and a second linear velocity v2, which is an upper limit, with respect to the rotating optical information recording medium,

a recording pulse generation step of generating a recording pulse signal, depending on a result of setting by the linear velocity setting circuit; and

a laser drive step of irradiating the optical information recording medium with the laser light based on the recording pulse signal generated by the recording pulse generation circuit,

wherein $Pbt1 \leq Pe1$ and $Pe2 < Pwb2 < Pwa2$ are satisfied,

the laser light is emitted while switching powers among the recording

power level, the first erase power level and the first inter-pulse power level, when the linear velocity v is $v1 < v < v0$,

a waveform of the laser light is caused to be a stepwise waveform such that a recording pulse of the power level Pwb2 is provided immediately after a recording pulse of the power level Pwa2, when the linear velocity v is $v0 < v < v2$, and

the power level Pwb of the second recording power is controlled so that (Pwb−Pe) is increased, depending on an increase in the linear velocity v,

where Pbt1 represents a first inter-pulse power level indicating a power level between recording pulses for the first linear velocity v1,

Pwa2 represents a recording power indicating a power level of the recording power for the second linear velocity v2,

Pwb2 represents a second recording power indicating a power level of a second recording power for the second linear velocity v2,

Pe1 represents a first erase power level indicating a power level of the erase power for the first linear velocity v1,

Pe2 represents a second erase power level indicating a power level of the erase power for the second linear velocity v2,

$v1<v0<v2$,

Pwb represents a power level of the second recording power for a linear velocity v of $v1<v<v2$, and

Pe represents a power level of the erase power for the linear velocity v.

18. The optical information recording method according to claim 17, wherein in the recording pulse generation step, a width of each step of the stepwise waveform is set to be longer than 1/2 of a channel clock cycle for the second linear velocity v2.

19. An optical information recording method, wherein a mark or a space having a length corresponding to a length of a data recording code is formed by

irradiating a rotating optical information recording medium with laser light to change optical characteristics of a photosensitive recording layer, and

the mark is formed by irradiation of the laser light with a power being switched among a plurality of power levels including at least a recording power level and an erase power level,

the method comprising:

a linear velocity setting step of setting a first linear velocity v1, which is a lower limit, and a second linear velocity v2, which is an upper limit, with respect to the rotating optical information recording medium,

a recording pulse generation step of generating a recording pulse signal, depending on a result of setting by the linear velocity setting circuit; and

a laser drive step of irradiating the optical information recording medium with the laser light based on the recording pulse signal generated by the recording pulse generation circuit,

wherein duty ratios of the recording pulses are set to be constant when the linear velocity v is $v1 \leq v < v0$ and when the linear velocity v is $v0 < v \leq v2$, respectively, and

the power level Pbt of the inter-pulse is controlled so that (Pbt–Pe) is increased, depending on an increase in the linear velocity v, when the linear velocity v is $v1 \leq v < v0$ and when the linear velocity v is $v0 < v \leq v2$, respectively,

where Pbt represents a power level between the recording pulses for a linear velocity v of $v1<v<v2$, Pe represents a power level of the erase power for the linear velocity v, and $v1<v0<v2$.

20. The optical information recording method according to claim 19, wherein a correction amount of an edge position of the recording pulse is controlled to be constant with reference to a channel clock cycle when the linear velocity v is $v1 \leq v < v0$ and when the linear velocity v is $v0 < v \leq v2$, respectively.

21. The optical information recording method according to any one of claims

11, 15, 17 and 19, wherein data is recorded onto the optical information recording medium using a CAV recording technique.

22. An optical information recording medium to be used for recording data by the optical information recording method according to claim 11, comprising information recorded thereon that indicates values of the first inter-pulse power level Pbt1 and the second inter-pulse power level Pbt2.

23. An optical information recording medium to be used for recording data by the optical information recording method according to claim 15, comprising information recorded thereon that indicates values of the first inter-pulse power level Pbt1 and the second recording power level Pwb2.

24. An optical information recording medium to be used for recording data by the optical information recording method according to claim 17, comprising information recorded thereon that indicates a value of the second recording power level Pwb2.

25. An optical information recording medium to be used for recording data by the optical information recording method according to claim 17, comprising information recorded thereon that indicates a value of the first inter-pulse power level Pbt1.

26. An optical information recording medium to be used for recording data by the optical information recording method according to claim 19, comprising information recorded thereon that indicates values of the inter-pulse power level Pbt and the duty ratio of the recording pulse.

27. An optical information recording medium to be used for recording data by the optical information recording method according to claim 20, comprising

information recorded thereon that indicates a value of a correction amount of an edge position of the recording pulse.